

Problem Set 9: Chemical Reaction Types

1) Describe the dynamics of a precipitation reaction.

A precipitation reaction: when two solutions are mixed and a precipitate forms. A precipitate is an insoluble solid ionic compound.

2) Describe the dynamics of a combustion reaction.

A combustion reaction: when a reactant combines with oxygen to form one or more compounds containing oxygen.

3) Describe the dynamics of an acid-base reaction.

An acid-base reaction: a neutralization reaction between an acid and a base that produces water and a salt.

4) Describe the dynamics of an oxidation-reduction reaction.

In a redox reaction one substance loses electrons and is oxidized, and one substance gains electrons and is reduced.

5) Assign oxidation numbers to every atom, and identify the oxidizing and reducing agents for each of the following reactions.

a) $4 \text{Fe} + 3 \text{O}_2 \rightarrow 2 \text{Fe}_2\text{O}_3$ Iron is oxidized, oxygen is reduced

0 0 +3 -2

b) $\text{P}_4 + 10 \text{Cl}_2 \rightarrow 4 \text{PCl}_5$ Phosphorous is oxidized, chlorine is reduced

0 0 +5 -1

c) $2 \text{Cr}^{3+} + \text{H}_2\text{O} + 6 \text{ClO}_3^- \rightarrow \text{Cr}_2\text{O}_7^{2-} + 6 \text{ClO}_2 + 2\text{H}^+$

+3 +1-2 +5 -2 +6 -2 +4 -2

Chromium is oxidized, chlorine is reduced

6) Choose the most correct statements about chemical equilibrium.

a) At equilibrium the number of the forward reactions per unit of time, and the number of reverse reactions per unit of time are equal.

b) At equilibrium the concentrations of the reactants and products are equal, and the forward and reverse reactions have ceased.

c) At equilibrium the reactants have been consumed, and only the reverse reactions are occurring.

d) At equilibrium the concentrations of the reactants and products no longer change.